DISTRIBUTION AND PHYSICAL CONDITION OF THE BEVERLY HERD OF BARREN-GROUND CARIBOU IN EARLY WINTER, 1983-84

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ABSTRACT

The Beverly Herd of barren-ground caribou (Rangifer tarandus) groenlandicus) travelled north between the Thelon River and Dubawnt Lake in mid-October 1983. Trails still visible in early November indicated that the caribou returned south via Eileen, Penylan, Rennie, and Damant lakes. A few caribou reached the Wholdaia and Selwyn lakes region before the herd reversed direction once again about mid-November. On 25 November 1983 the major segment of the herd was concentrated on the tundra between Damant and Sid lakes. By 8 December, the bulk of the herd was located in a triangle between Great Slave, Eileen, and Whitefish lakes. On 17 December, that herd segment occupied a large region in and around the East Arm of Great Slave Lake. The caribou moved at an average rate of 15.4 km (9.6 mi) per day from 25 November to 17 December. The unusual movement pattern may have been triggered by a warm early winter, a late freeze-up and light snowfall.

Examination of 75 caribou collected east of Tent Lake on 11-15 December 1983 revealed that the caribou were in only fair condition, although they had slightly greater fat reserves than in late November 1982. In females 5½-10½ years old, averages for body weight, depth of back fat, and the kidney fat index were 182 lbs, 13 mm, and 47, respectively. The pregnancy rate in females 3½ years old and older was 82%, compated with 74% in 1982-83, and 91% in 1981-82.

INTRODUCTION

A study of the impact of fire on the Beverly Herd of barren-ground caribou was started in the winter of 1982-83. The region of intensive study in the Northwest Territories was from 60°N to the limit of trees and from 102° to 112°W. Major components of the study are: 1) monitoring of the winter movements of the herd in relation to individual burns, the general burn pattern, various range units, and weather; 2) assessment of the adequacy of the present winter range (for the current population) from measurements of physical condition of the caribou in early and late winter; and 3) range studies, including the distributions of range types and forest ages, and the relationship between forage biomass and time since fire.

This is a brief report on movements and physical conditions of the Beverly Herd in the first half of the second winter of the 4-year field study (objectives 1 and 2 above). The data will change slightly when ages are checked by counting rings in stained sections of teeth. The movement pattern of caribou and their reactions to burns will be reported later this year in a detailed report on movements of the Beverly Herd during the winters of 1982-83 and 1983-84.

METHODS

The distribution and movements of the herd was monitored on reconnaissance flights on 22 and 23 October, 24 and 25 November, and 7, 8, 16, and 17 December 1983 (Fig. 1). Survey aircraft included Cessna 185 and 210, a Beechcraft Baron, and an Islander. Under the difficult flying conditions in early winter, the objective of the reconnaissance

flights was to monitor the movement pattern of the main herd and observe how it, and groups within it, responded to burned terrain. Survey altitude varied from 100-200 m agl and ground speed from 200-300 kmph depending on survey conditions.

On 10 December, a field camp was established at 62°32'N, 107°34'W, 14 km (9 mi) east of the northeast arm of Tent Lake. The location was determined not so much by herd distribution but as a suitable location for a camp on the edge of the tundra where there was sufficient ice (46 cm/18") for a Twin Otter aircraft to land. Extreme cold and an aircraft malfunction on 10 December prevented us from checking ice thicknesses and potential camp locations in the forest near the front of the movement between Artillery Lake and the Snowdrift River. From 11-15 December, 75 caribou were collected and sampled in the same manner as in previous collections of the herd (Thomas 1983). The carcasses and camp were returned to Fort Smith on 14 and 15 December by DC-3 aircraft. The sampling was delayed 2½ weeks because of inadequate ice thickness for wheeled aircraft and a logistically unfavourable location of the herd in November.

RESULTS

1. Movement patterns, October-December 1983

Surveys conducted 22 and 23 October indicated that substantial numbers of caribou had recently travelled north between the Thelon River and Dubawnt Lake. 'Heavy' trails were noted all along the flight path (Fig. 1), which included Jim, Beaverhill, Dubawnt, and Mosquito lakes.

In forested regions, 183 caribou were counted in 9 groups located just east of Bull Lake. Two small groups were seen on Damant and Coyne lakes; 28 caribou in 4 groups to the west of Boyd Lake. All 15 groups were travelling south and evidently they had split from the main concentration, which was travelling in the opposite direction.

Surveys by T. Trottier (pers. comm. 1983) indicated that caribou were travelling south in the Wholdaia, Flett, and Selwyn lakes region in early November. The movement apparently reversed direction as he reported trails in an east-west direction and he received reports of caribou travelling northeast on the west side of Snowbird Lake in mid-November.

We saw approximately 72,000 caribou on 25 November on a transect through the concentrations on the tundra between Rennie-Gardenia and Sid lakes, including 68,000 between 62° and 62°25'N and between 104° and 105°W. We estimate that 25% to 50% of the herd was encountered along the flight path. The predominant direction of movement was northwest (Fig. 3).

On 8 December, the herd's distribution straddled the line designated as the "limit of trees" and the leaders were on a 128 km (80 mi) front from 14 km (9 mi) east of Reliance to the south end of Artillery Lake, Sandy Lake, and the north end of Whitefish Lake (Fig. 2). The high density of caribou extended from the front of the movement to the Tent and Catholic lakes region. Smaller groups were still present in the Eileen, Huff, and Timberline lakes region.

We estimated that we saw close to 34,000 caribou on 5 transects through the herd on 9 December. The greatest concentrations were on the

tundra between Catholic Lake and the Snowdrift River and south of Artillery Lake in the open Transitional Forest Zone. The 'heaviest' trails were on the tundra near the "limit of trees". About 16 km (10 mi) east of Reliance, the caribou were fanning out: some were travelling northwest and others southwest. A few caribou were splitting off the main flow and travelling west in the McKinnon and Satin lakes region and these groups reached the north end of Nonacho Lake by mid-December. In 13 days, from 25 November to 8 December, the front of the movement shifted 211 km (132 mi), an average of 16.1 km (10.2 mi) per day.

On 17 December, the caribou were distributed along a 320 km (200 mi) front from Nonacho Lake to Snowdrift, Pethei Peninsula (Great Slave Lake), Lac du Mort, Indian Hill Lake, Margaret Lake, and Fletcher Lake (Fig. 2). A few caribou were as far west as 111°40' in the McKinlay-Wolverine lakes region. They were all travelling in a west to northwest direction. The region just north of McLeod Bay (Great Slave Lake) is an area of overlap in the winter range of the Beverly and Bathurst herds. However, the main segment of the Beverly Herd had not been reported there before 1983.

Caribou that travelled southwest of Noman and Nonacho lakes turned to the west at about 62°N (Fig. 3). Some of the caribou that travelled to the south of the East Arm of Great Slave Lake were crossing the lake, in a northwest direction, from Snowdrift to Reliance. Just north of the East Arm, the direction of movement was predominantly west but further north, from Lac Tête d'Ours to Fletcher Lake, it was generally west-northwest. A few caribou were still moving northwest in the Whitefish, Tent, and Eileen lakes region. Thus, the main distribution spanned at

least 176 km (110 mi) on the north-south axis, 108 km (130 mi) on the east-west axis, and 225 km (140 mi) along its long (WNW-ESE) axis. An estimated 25% of the herd was still on the tundra.

The front of the movement had changed by 128 km (80 mi) from 8 to 17 December, an average of 14.2 km (8.9 mi) per day. From 25 November to 17 December 1983 (22 days) it had moved 339 km (212 mi), an average of 15.4 km (9.6 mi) per day.

The movement pattern of the Beverly Herd was vastly different in early winter 1982-83. In October 1982, the herd entered the forest in the Firedrake Lake region and then travelled west to about 108°W. In November 1982, the main segment of the Beverly Herd also travelled northwest and north but it was in the forest in the Manchester, Porter and Grey lakes region (Fig. 4). The herd reached the tundra in the Tent and Eileen lakes region on 2 December 1982, and spent about one month on the tundra before returning to the lower Snowdrift River region in early January. It circulated in the outer fringe of the forest and onto adjacent tundra during January and February. By 11 March the herd was migrating north and had reached the tundra in the Eileen and Tent lakes region.

2. Composition of the sample

There was a high proportion of caribou 1½ to 4½ years old in the December 1983 sample (Table 1). The probable reasons are selection against shooting calves, lack of adult males in the region, and the probable over-representation of young caribou in the region at the time of the collection. The sample was from the tail of the movement. The

leaders reached Tent Lake about 6 days before the collection began and probably 75% of the caribou that passed through the camp region had passed before the sampling began. The samples obtained in March 1982 and 1983, and November 1982, were obtained from similar components of the herd and their age compositions were similar (Thomas and Kiliaan 1982, Thomas et al. 1983, Thomas 1983).

3. Physical condition

Weight increased with age in both sexes until the 3½ year class (Table 2). Depth of back fat in five age classes of males averaged only 0.9 to 2.4 mm. In females, it ranged from 6.7 mm in yearlings to 19 mm in 3½-year-olds. The weight of kidney fat reflected the same sex and age-related trends in condition. The kidney fat index, the relative weight of kidney fat to kidney weight, also indicated the same trends except that the indices for males declined after the yearling age-class.

The number of warble fly larvae is not a measure of condition but they may reflect the degree of harassment by warble flies the previous summer. In males, numbers of larvae were highest in calves (72) and similar (25- 37) in older age-classes. Numbers of larvae in females were generally much lower than in males and varied from 8 to 14, except for 24 in the 2½-year age-class (Table 2). The numbers of larvae were much lower in all age-classes compared with the March 1983 collection (Thomas 1983). For example, in females 5½-10½, the respective means were 8 and 56. Blood was not obtained from the specimens because of logistical difficulties.

A comparison of three condition indices with results for November 1982 (Table 3) reveals slightly higher values in 1983 for the indices in all age classes. The most reliable comparisons are for females 5½-10½ years old because of the larger sample sizes. None of the differences are statistically significant, however, because of fairly high variability in condition within age classes.

4. Pregnancy rates

None of seven yearlings was pregnant as indicated by lack of fluid in their uteri. All females will be checked later for structures in the ovaries that form after ovulation in breeding females. Four of six 2½-year-old females were pregnant, as were all six females 3½ years old. However, only 76% of 21 older females were pregnant. Overall, the pregnancy rate was similar to that in March 1983 and lower than in March 1982 (Table 4). The high rate in 3½-year-old females is attributed to chance and a small sample size. When the 3½-year-old females are pooled with older females, the pregnancy rates in 1981-82, 1982-83, and 1983-84 were 91% ($\underline{N}$ = 55), 74% ($\underline{N}$ = 69), and 82% ($\underline{N}$ = 27), respectively. These values appear to parallel changes in condition indices over the 3 years. An analyses of these relationships will be made after the March 1982 sample and the final analysis will await ages based on tooth sections and data for 1984-85 and 1985-86.

5. Weather and the movement pattern.

Lakes froze later than usual on the range of the Beverly Herd in early winter 1983-84. On 22 and 23 October, larger lakes on the tundra

as far north as Dubawnt Lake had only thin ice around their edges. Small lakes were frozen. The same conditions prevailed in the outer 160 km (100 mi) of the forested regions. A thin layer of snow was melting on 23 October, even on the tundra. By 25 November, all lakes were frozen except for a few large ones within 260 km (100 mi) of Fort Smith. There appeared to be about 5-10 cm (2-4") of snow over most of the range although we were unable to land with the aircraft available for surveying. There was about 18 cm (7") of snow at a sheltered location east of Tent Lake on 10 December but only 5-10 cm (2-4") of snow on the lake, with occasional drifts as deep as 20 cm (8"). Snow was soft on the tundra, although some drifting had occurred. A hard crust of snow about 10 cm thick was present on the ground in treed areas. Drifting occurred from north winds in late November-early December and from west winds on 13 and 14 December. The caribou were seeking the shelter of trees and hills on 7 December when it was -32°C with a strong wind from the north.

The movement pattern from 24 November to 17 December was generally parallel to the tree line with gradual and increasing penetration of the forest. The movement to the north and northwest during the second half of November occurred when temperatures were above normal and snowfall was light. The direction of movement did not change in December, which was extremely cold, although there was gradual penetration of the forest. The unusual movement pattern may have been triggered by unusual weather but it was not interrupted when the weather changed. Barren-ground caribou appear to prefer to stay on the tundra if conditions allow them to do so.

ACKNOWLEDGEMENTS

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Table 1. Composition of the December 1983 sample of barren-ground caribou obtained 14 km (9 mi) east of Tent Lake, NWT.

Age (yr)[a]	Females	Males	Both sexes	Percentage of total
½	0	7	7	9.3
1½	7	6	13	17.3
2½	6	12	18	24.0
3½	6	7	13	17.3
4½	5	3	8	10.7
5½–10½	15	0	15	20.0
11½	1	0	1	1.3

[a]Based on tooth eruption and degree of tooth wear.

Table 2. Physical condition statistics (mean ± SE[a]) for the December 1983 sample of caribou obtained east of Tent Lake, NWT.

Sex & age (yr)	N[b]	Weight		Back fat	Kidney fat		No. warble fly larvae
		Pounds	Kg	depth (mm)	Weight	Index	
Male ½	7	97 ± 3	44 ± 1	0.9 ± 0.3	31 ± 3	30 ± 4	72 ± 26
Female 1½	7	120 ± 3	55 ± 2	6.7 ± 2.2	52 ± 6	41 ± 5	14 ± 3
Male 1½	6	147 ± 5	67 ± 2	1.2 ± 0.6	53 ± 12	35 ± 7	34 ± 6
Female 2½	6	157 ± 3	72 ± 1	9.0 ± 3.8	81 ± 14	54 ± 10	24 ± 10
Male 2½	12	186 ± 5	85 ± 2	0.6 ± 0.1	56 ± 5	32 ± 4	25 ± 8
Female 3½	6	180 ± 5	82 ± 2	19 ± 3.9	114 ± 15	69 ± 10	9 ± 3
Male 3½	7	221 ± 10	100 ± 5	2.4 ± 1.4	56 ± 11	27 ± 5	37 ± 15
Female 4½	5	164 ± 7	75 ± 3	11 ± 4.8	68 ± 14	41 ± 8	12 ± 5
Male 4½	3	216 ± 8	98 ± 4	1.0 ± 1.0	50 ± 20	26 ± 8	30 ± 12
Female 5½-10½	15	182 ± 3	83 ± 1	13 ± 2.9	83 ± 9	47 ± 5	8 ± 3
Female 11½	1	212	97	20	116	59	11

[a]SE = Standard error, a measure of varition about the mean.
[b]Sample size.

Table 3. Physical condition indices of the Beverly Herd in November 1982 and December 1983. (Sample sizes in parentheses.)

Sex & age (yr)[a]	Weight (pounds)		Depth back fat (mm)		Kidney-fat index	
	November 1982	December 1983	November 1982	December 1983	November 1982	December 1983
Male ½	93 (5)	97 (7)	0.5 (4)	0.9 (7)	24 (4)	30 (7)
Female 1½	134 (8)	120 (7)	5.0 (8)	6.7 (7)	45 (7)	41 (7)
Male 1½	145 (7)	147 (6)	0.3 (6)	1.2 (6)	21 (6)	35 (6)
Female 2½	155 (3)	157 (6)	1.7 (3)	9.0 (6)	49 (3)	54 (6)
Male 2½	186 (4)	186 (12)	0.5 (4)	0.6 (12)	20 (4)	32 (12)
Female 3½	175 (2)	180 (6)	21 (1)	19 (6)	54 (2)	69 (6)
Male 3½	207 (9)	221 (7)	0.2 (10)	2.4 (7)	17 (9)	27 (7)
Female 4½	176 (8)	164 (5)	9.0 (9)	11 (5)	45 (10)	41 (5)
Male 4½	187 (3)	216 (3)	8.0 (3)	1.0 (3)	13 (1)	26 (3)
Female 5½–10½	180 (18)	182 (15)	9.4 (19)	13 (15)	40 (19)	47 (15)
Female 11½+	176 (3)	212 (1)	0.5 (2)	20 (1)	21 (1)	59 (1)
Female >3	178 (31)	179 (27)	9.6 (31)	13.8 (26)	43 (34)	51 (26)

[a]Estimated from dental eruption pattern and degree of wear.

Table 4. Age-specific pregnancy rates (percent) of barren-ground caribou sampled from the Beverly Herd in March 1982 and 1983, and December 1983. (Sample sizes in parentheses.)

Age[a]	March 1982 (1981-82)		March 1983 (1982-83)		December 1983 (1983-84)	
2	8	(13)	0	(15)	0	(7)
3	75	(4)	60	(10)	67	(6)
4	75	(8)	57	(23)	100	(6)
>4	94	(47)	83	(46)	76	(21)

[a]At next birthday, based on dental wear and eruption pattern.

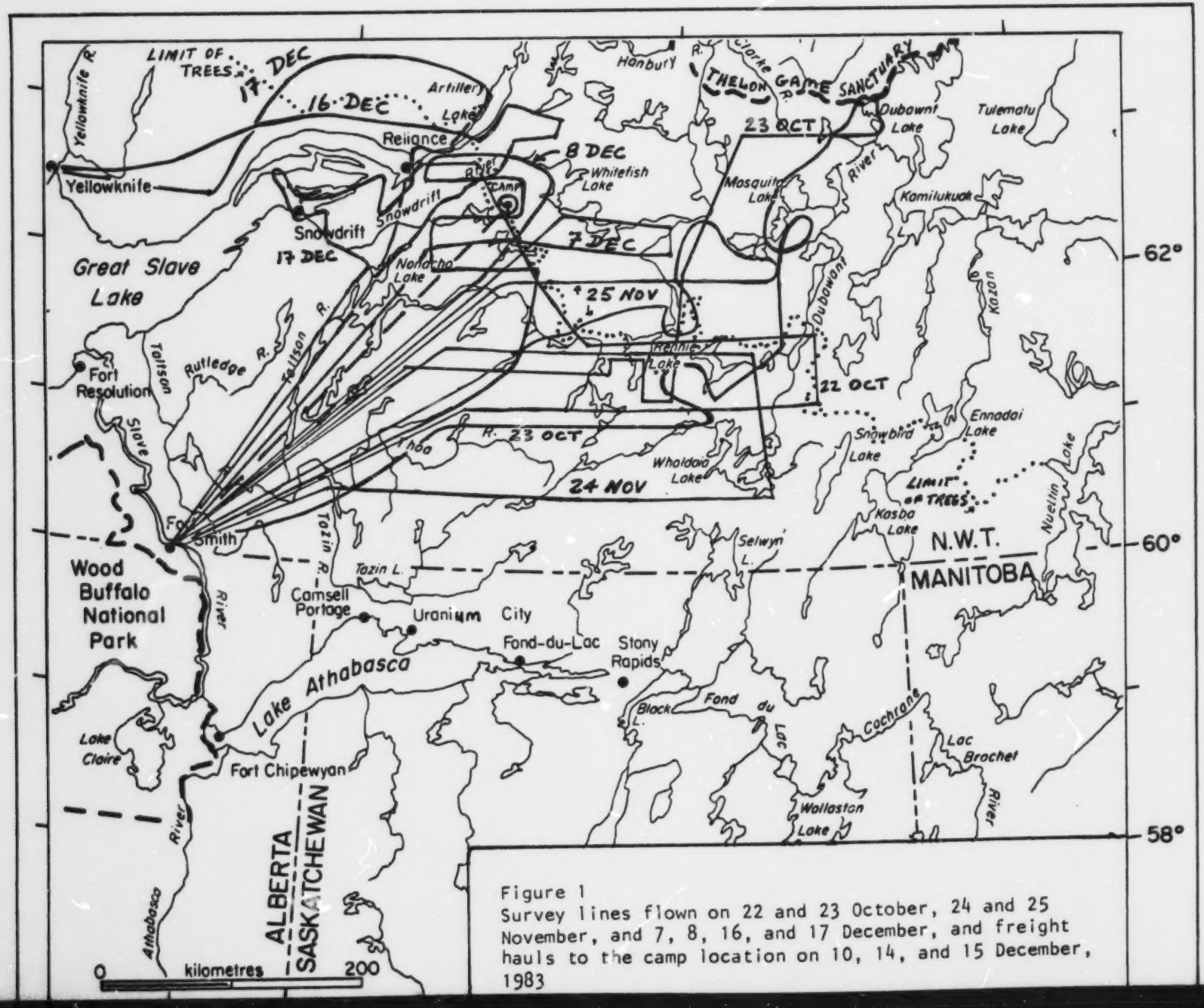

Figure 1
Survey lines flown on 22 and 23 October, 24 and 25 November, and 7, 8, 16, and 17 December, and freight hauls to the camp location on 10, 14, and 15 December, 1983

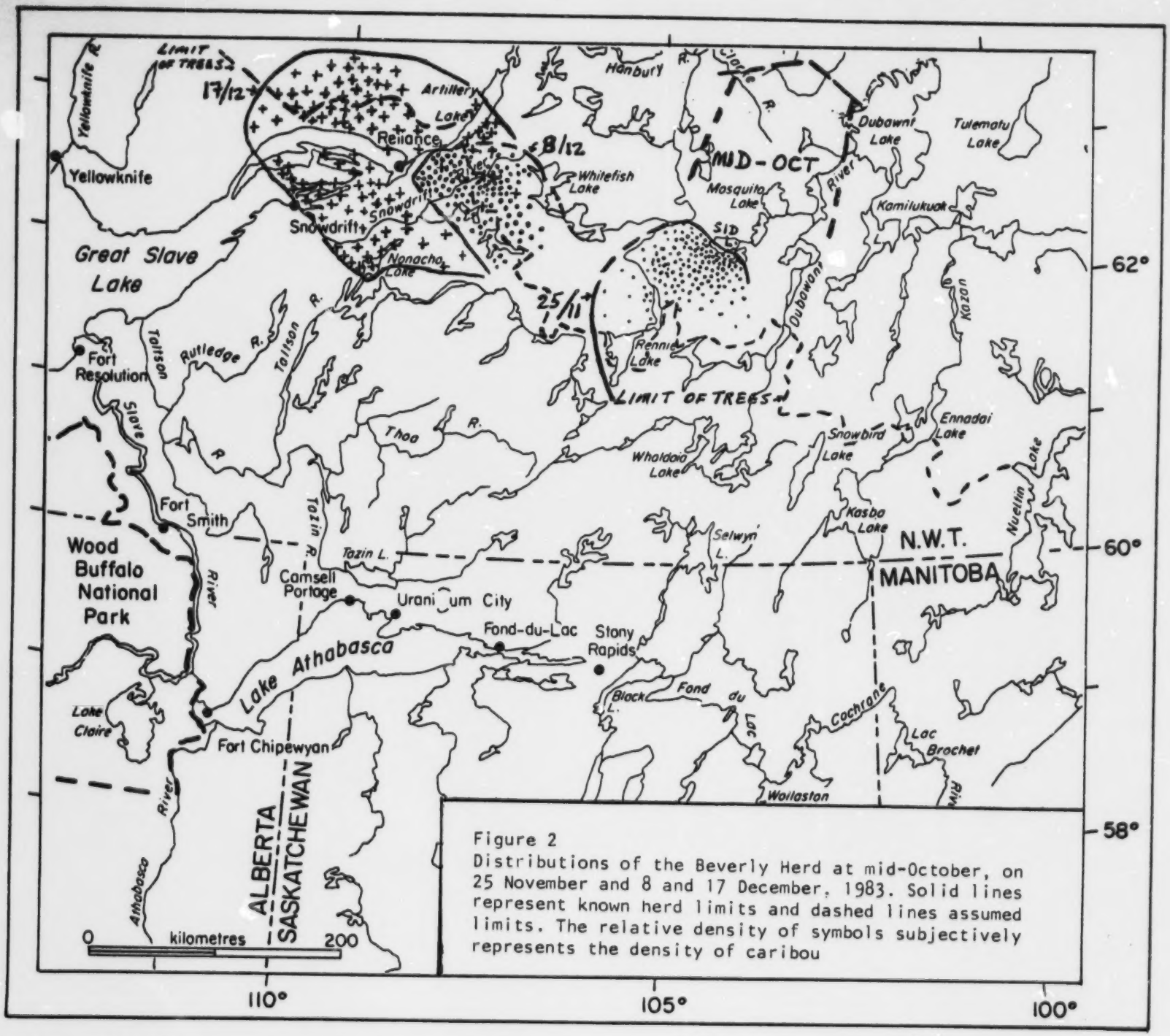

Figure 2
Distributions of the Beverly Herd at mid-October, on 25 November and 8 and 17 December, 1983. Solid lines represent known herd limits and dashed lines assumed limits. The relative density of symbols subjectively represents the density of caribou

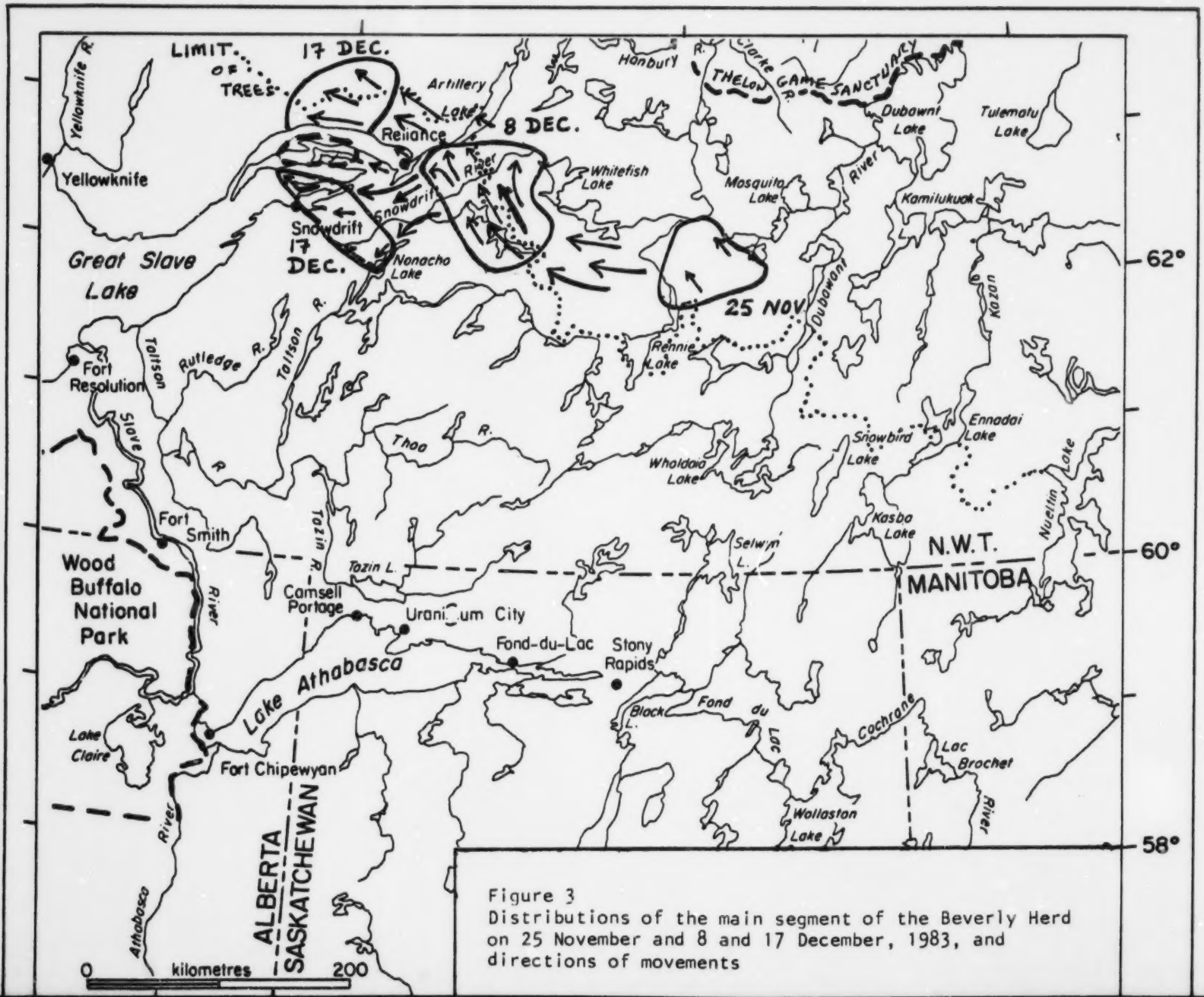

Figure 3
Distributions of the main segment of the Beverly Herd on 25 November and 8 and 17 December, 1983, and directions of movements

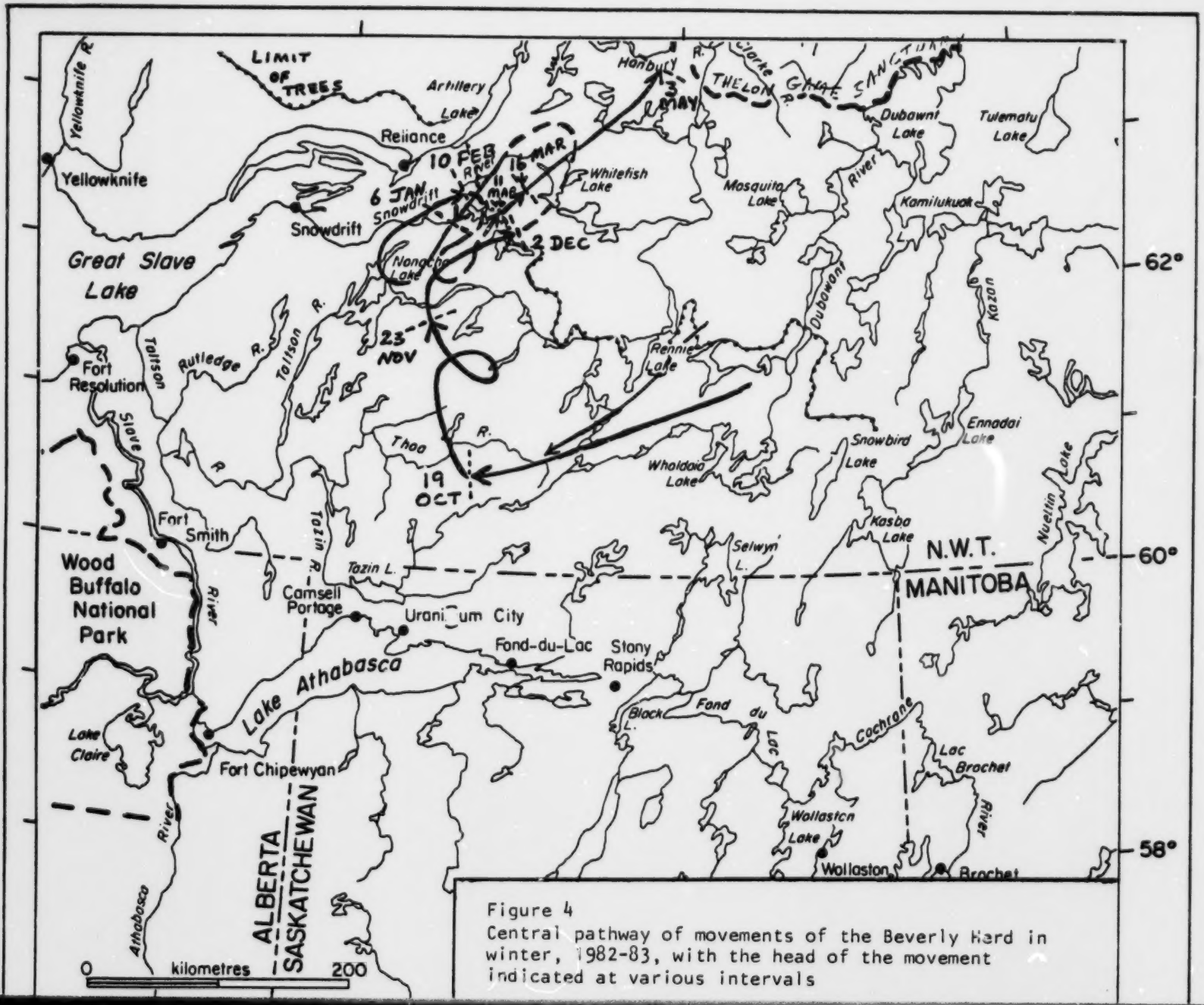

Figure 4
Central pathway of movements of the Beverly Herd in winter, 1982-83, with the head of the movement indicated at various intervals